Misallocation

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BREAD-IGC Virtual PhD Course on Firms and Development

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Lecture outline

1. Definition and simple model
2. Examples of misallocation
3. Five facts about misallocation
4. Three promising directions for future research
5. Datasets on firms and plants
6. Overview of the recent literature

My definition of misallocation

Misallocation exists if a social planner could implement budget-neutral targeted taxes and subsidies to induce the reallocation of inputs across activities (e.g., across products, firms, or occupations) in a way that could generate a Pareto improvement.

Example: Taxing polluting activities and subsidizing non-polluting activities.

This is just the efficiency of resource allocation — all of economics is about this! Well, at least the portion of economics that is not about how to redistribute resources to maximize social welfare across heterogeneous individuals. One might want to suffer some misallocation if it reduces consumption inequality and thereby raises average welfare.

"could implement" rules out things like repealing gravity to eliminate transportation costs

"could implement" also requires that the government observes its targets

Simple model setup

- $Y = \left(\sum_{i=1}^{M} Y_i^{1-\frac{1}{\sigma}}\right)^{\frac{1}{1-\frac{1}{\sigma}}}$, $P = \left(\sum_{i=1}^{M} P_i^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$
- $Y_i = A_i L_i$
- max $(1 - \tau_i^Y) P_i Y_i - w L_i$
  - Monopolistic competitor takes w, Y, and P as given
- $L = \sum_{i=1}^{M} L_i$
- Exogenously fixed L and M

Simple model results

- $P_i = \left(\frac{\sigma}{\sigma - 1}\right) \times \left(\tau_i \cdot \frac{w}{A_i}\right)$, where $\tau_i \equiv \frac{1}{1 - \tau_i^Y}$
- $\text{TFPR}_i \equiv \frac{P_i Y_i}{L_i} \propto \tau_i \neq A_i \equiv \text{TFPQ}_i$
- $\text{TFP} \equiv \frac{Y}{L} = \left[\sum_{i=1}^{M} A_i^{\sigma-1} \left(\frac{\tau_i}{\tau}\right)^{1-\sigma}\right]^{\frac{1}{\sigma-1}}$
- $(A_i, \tau_i) \sim LN(\mu_A, \mu_\tau, \sigma_A^2, \sigma_\tau^2, \sigma_{\tau A}) \;\Rightarrow\; \log(\text{TFP}) = \mu_A + \frac{\sigma - 1}{2} \cdot \sigma_A^2 - \frac{\sigma}{2} \cdot \sigma_\tau^2$

Lessons from the simple model

- Wedges show up in TFPR
- TFPR $\neq$ TFPQ (so do not use the former to proxy for the latter)
- Aggregate TFP is decreasing in the dispersion of wedges (misallocation)
- Aggregate TFP is unrelated to the mean wedge (in this static model)
- Aggregate TFP is increasing in the dispersion of TFPQ because $\sigma > 1$

More on TFPQ

- Can infer Y from revenue by inverting the demand curve: $Y_i \propto (P_i Y_i)^{\frac{\sigma}{\sigma-1}}$
  - Captures quality as well as quantity
- Then $\text{TFPQ}_i = Y_i/L_i$
  - Composite of process efficiency and quality
- If also have data on physical quantities Q_i, can infer process efficiency from Q_i/L_i
- Can then estimate quality separately from process efficiency as $\text{TFPQ}_i/(Q_i/L_i)$

Easy model generalizations

- Physical capital (Hsieh and Klenow, 2009 QJE)
- Intermediates (Bils, Klenow and Ruane, 2021 JME)
- Wedges on all inputs (HK 2009, BKR 2021)
- Overhead costs (Bartelsman, Haltiwanger and Scarpetta, 2013 AER)
- Entry costs (Dhingra and Morrow, 2019 JPE)

Harder (but still doable) generalizations

- Financial frictions
  - Buera, Kaboski and Shin (2011 AER), Moll (2014 AER), Midrigan and Xu (2014 AER)
- Adjustment costs
  - Asker, Collard-Wexler and De Loecker (2014 JPE), David and Venky (2019 AER)
- VES instead of CES (Dhingra and Morrow 2019; Edmond, Midrigan & Xu 2023 JPE)
- Non-monopolistic competition (Edmond, Midrigan and Xu, 2015 AER)
- Arbitrary input-output network and RTS (Baqaee and Farhi, 2020 QJE)

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What is *not* misallocation

TFPR dispersion due to ...

- Measurement error in revenue or inputs
- Unavoidable adjustment costs or transportation costs
- Differential riskiness of investments in physical capital, R&D
- Compensating differentials for labor (amenities and disamenities)
- Misspecification of the production function
  - E.g., ignoring heterogeneity in production elasticities or overhead costs

What *can* generate misallocation

TFPR dispersion due to ...

- Tax rate differences across firms (e.g., lower tax rates for oil and gas firms)
- Size-dependent regulations (e.g., firing restrictions on bigger firms)
- Price markup differences across products (e.g., Apple vs. Samsung smartphones)
- Wage markdown differences across firms (e.g., Apple and Google collusion)

Other potential sources of misallocation

- Discrimination
  - Labor market, lending, housing, school admissions/funding
- Financial frictions, state-owned banks, cronyism
- Efficiency wages in some firms or industries relative to others
- Licensing, entry, and land use restrictions
- Under- or over-investment in public R&D, infrastructure
- Externalities (positive or negative)

The Allocation of Talent in the U.S. (1/2)

Share of each group in *high-skilled occupations*: lawyers, doctors, engineers, scientists (excluding social scientists), architects, mathematicians and executives/managers

	1960	2018
White men	18.8%	26.3%
White women	5.3%	21.2%
Black men	2.5%	15.5%
Black women	1.3%	15.8%

Source: U.S. Census data; Hsieh, Hurst, Jones and Klenow (2019 ECMA)

The Allocation of Talent in the U.S. (2/2)

- Consistent with falling discrimination in the U.S. from 1960 to 2010
- Can generate gains from comparative advantage and human capital investment
- May have accounted for 40% of growth in GDP per capita
- And 25% of growth in GDP per worker (the difference due to rising participation)
- Repeatable? Maybe so, especially in research – see Brouillette (2022)

Source: Hsieh, Hurst, Jones and Klenow (2019)

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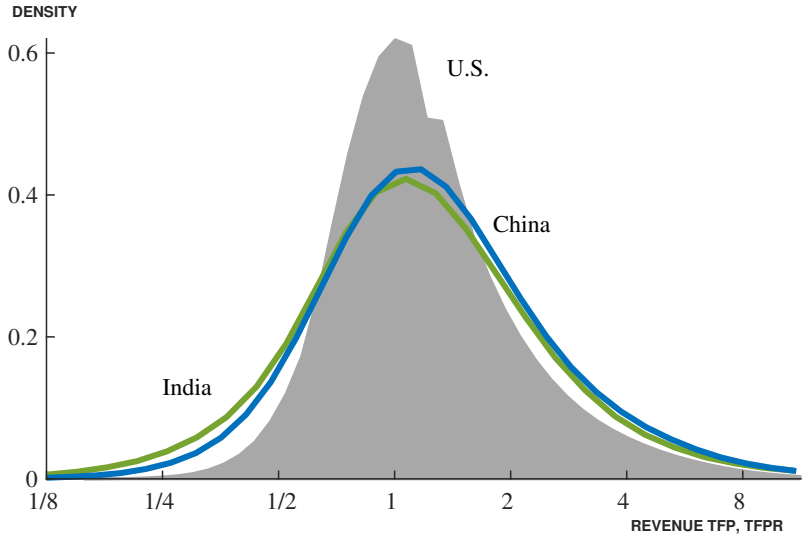
Five Facts about Misallocation

1. TFPR is more dispersed in developing economies than in advanced economies
2. TFPR is strongly increasing in TFPQ, especially in developing economies
3. Most dispersion is in TFPR rather than in one of VAPK, VAPL, or VAPX
4. Much of the TFPR dispersion is persistent over time
5. Much of the VAPK dispersion is *within* firms in U.S. manufacturing

Fact 1: TFPR dispersion



Relative to the U.S. in the same year

	Misallocation	**TFP**
China in 1998	1.5	2.3
India in 1994	1.4	2.6

So misallocation may account for roughly 1/2 of the TFP gap in manufacturing between China and the U.S., and 1/3 of the TFP gap between India and the U.S.

Source: Hsieh and Klenow (2009)

Growth from reducing misallocation vs. TFP growth

	From ↓ misllocation	**Actual**
China from 1998–2005	2.0%	6.2%
India from 1987–1994	-1.8%	0.3%

Source: Hsieh and Klenow (2009)

Chinese gains from SOE reforms, 1998–2005

From ↓ misllocation	From SOEs vs. rest
15%	6%

- falling share of SOEs (which shrank TFPR dispersion)
- smaller TFPR gap between surviving SOEs and POEs

Source: Hsieh and Klenow (2009)

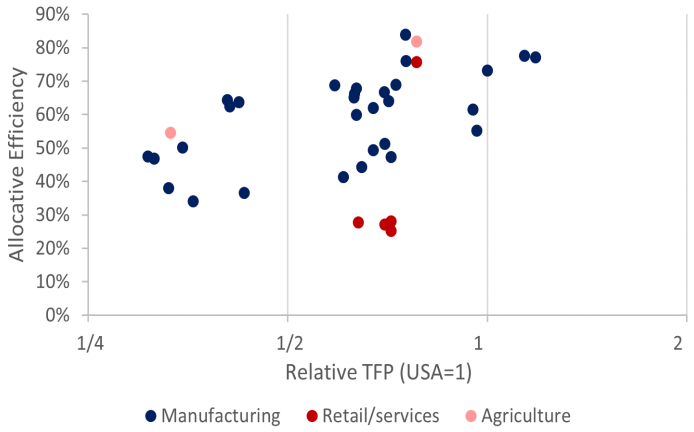
Implications of TFPR dispersion for aggregate TFP

- Baqaee and Farhi (2020): $\downarrow$ aggregate TFP for U.S. Compustat firms by $\sim 20\%$
- HK (2009): $\downarrow$ manufacturing TFP by 30–60% in China and India vs. the U.S.
- IADB (2010): similar losses in manufacturing in various Latin American countries
- Same for Peters (2020 ECMA) on Indonesian manufacturing
- Restuccia et al. (2017, 2022): even larger losses in agriculture in Malawi and China

37 country studies

Argentina	Bolivia	Brazil (2)	Chile (2)
China (2)	Colombia	Ecuador	France (2)
India	Indonesia (2)	Italy	Ivory Coast
Japan	Kenya	Malaysia (2)	Mexico (6)
Portugal (3)	Sri Lanka	Thailand	Turkey
Ukraine	United States	Uruguay	Venezuela

Allocative Efficiency vs. TFP



Higher allocative efficiency in high TFP countries

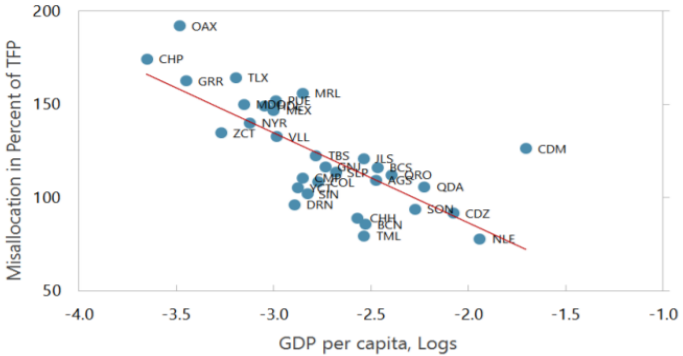
Elasticity of 0.40 (s.e. 0.11) so 40% of TFP differences?

Caveats:

- TFP is for the whole economy
- Varying sample frames (typically broader coverage in rich countries)
- These all use $\sigma = 3$, which is conservatively low
- Measurement error could be worse in poorer countries
- Too few studies for agriculture, services, retail trade

Across Mexican states (Misch and Saborowski, 2018)

Figure 2. Correlation between State-level per Capita Incomes and Resource Misallocation, 2013



Notes: The figure shows the distribution of the state-level TFP gains in percent based on Equation 11 if resources were allocated optimally across firms within all sectors under consideration within each state.
Sources: 2013 Mexican Economic Census, National Account Statistics and own compilation.

Harberger Triangles

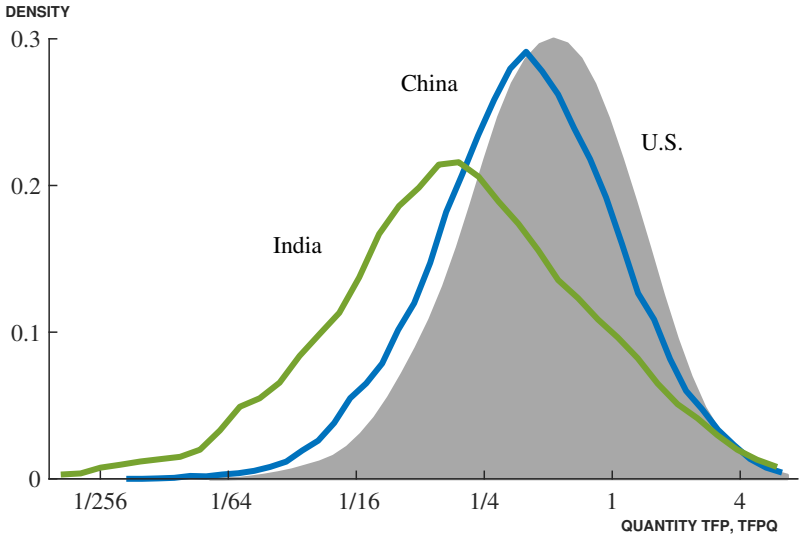
Harberger (1954): costs of monopoly $<<$ 1% of GDP

Baqaee and Farhi (2020) found two orders of magnitude more damage

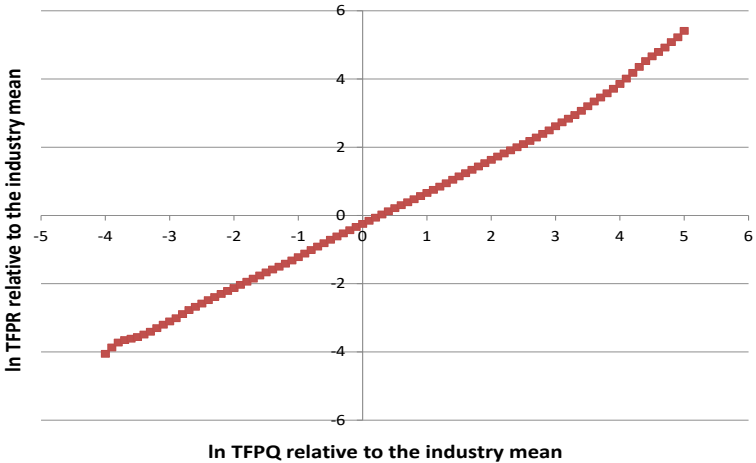
- Bigger wedges within than across industries
- More substitutability within than across industries
- Propagation from the input-output network

Also see Jim Schmitz's magisterial body of work!

Corollary: TFPQ dispersion is greater in developing economies



Fact 2: TFPR is increasing in TFPQ



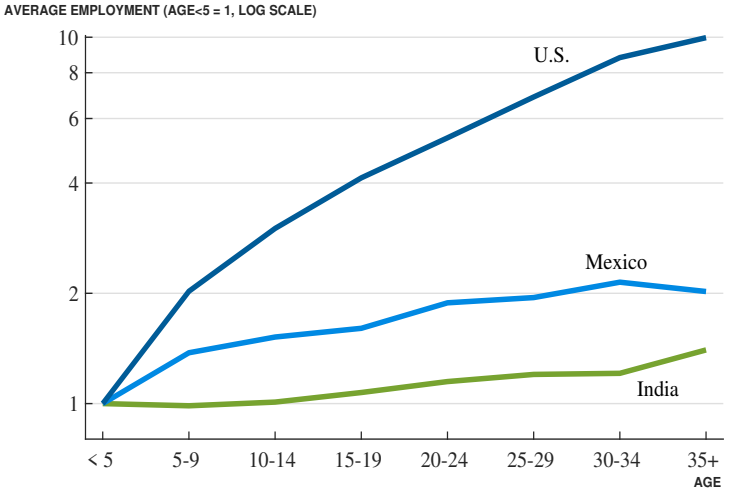
Source: Hsieh and Klenow (2014 QJE) evidence across India units in 1994

Dynamic effects of static misallocation

If barriers are increasing in productivity ...

- firms may invest less in productivity and quality before they enter
  - Bento and Restuccia (2017 AEJ-Macro)
- and innovate less after they enter
  - Hsieh and Klenow (2014 QJE), Akcigit, Alp and Peters (2021 AER)
- and enter in greater numbers
  - Atkeson and Burstein (2010 JPE), Fattal Jaef (2021 AEJ-Macro)

The Life Cycle of Plants



Fact 3: Scale Distortions > Mix Distortions

- **Scale**: common component of VAPK, VAPL, and VAPX
- **Mix**: ratios of VAPK/VAPL, VAPK/VAPX, VAPL/VAPX
- David and Venky (2019) and BKR (2021) find mostly *scale* distortions
- Suggestive of markups, revenue taxes/subsidies, errors in revenue/(all inputs)
- Not a dominant role for financial frictions, risk, or wage markdowns

Scale vs. Mix distortions in China and India

Misallocation allowing for plant-specific capital elasticities:

	α_s	α_{si}
China 1995	31%	24%
India 1994	59%	39%

So mix distortions matter, but scale distortions matter more.

Source: Hsieh and Klenow (2009)

Fact 4: Persistence of TFPR differences

- Most of the variance in TFPR is in the firm or plant fixed effect
- David and Venky (2019) for U.S. publicly listed firms and Chinese industrial firms
- BKR (2021) for Indian plants and U.S. plants, both in manufacturing
- Suggestive of persistent markups, measurement error, or taxes/subsidies
- Not consistent with a dominant role for financial frictions or adjustment costs

Fact 5: Dispersion of VAPK across plants *within* firms

- Kehrig and Vincent (2020 R&R at REStud) for U.S. manufacturing
- Most of the variance in VAPK is across plants within firms
- So cannot be financial frictions?
- They say it reflects the interaction of lumpy adjustment costs and financial frictions
- Also consistent with plant-specific markups or production elasticities within firms

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Three promising directions for future research

A. Explicit policies and distortions

B. Natural and policy experiments

C. Inequality vs. Misallocation

Examples of explicit policies and distortions

- Firing costs in Italy — Hopenhayn and Rogerson (1993 JPE)
- Size-dependent regulations in Italy and France
  - Ventura and Xu (2008 RED), Garicano, Lelarge, Van Reenen (2016 AER)
- U.S. state taxes — Fajgelbaum, Morales, Suarez Serrato, and Zidar (2019 REStud)
- Brazilian interest rates — Cavalcanti, Kaboski, Martins, and Santos (2021)

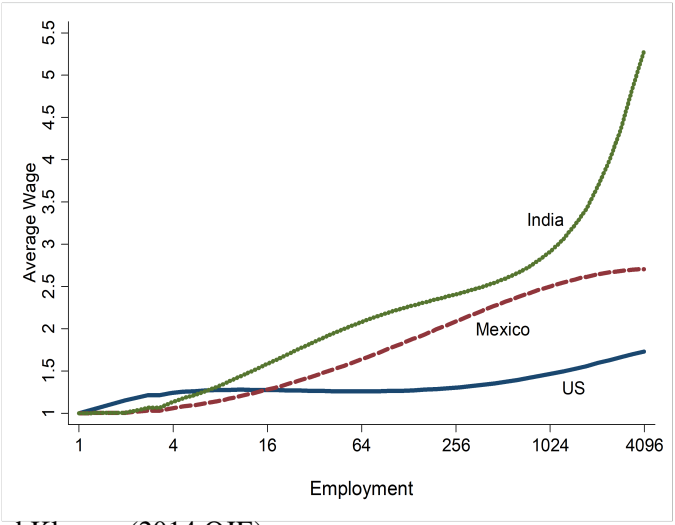
Natural and policy experiments

- Portuguese capital requirements — Blattner, Farinha and Rebelo (2019)
- FDI liberalization in India — Bau and Matray (2023 ECMA)
- Brazilian bank branch expansion into poorer cities
  - Firm entry and growth — Bazzi, de Freitas Oliveira, Muendler and Rauch (2021)
  - Wage inequality — Fonseca and Matray (2022)

Misallocation vs. Inequality

- Autor, Dorn and Hanson (2013 AER) — the China shock in the U.S.
- Goldberg and Pavcnik (2017 JEL) — trade liberalization and inequality in LMICs
- Atkin, Faber and Gonzalez-Navarro (2018 JPE) — FDI into Mexican retail
- Ryan and Sudarshan (2020) — water rights in India
- Hsieh, Klenow and Rockall (work in progress) — size wage premium

Plant Wages vs. Plant Size



Source: Hsieh and Klenow (2014 QJE)

Misallocation vs. *Equality*

- Banerjee and Duflo (2014 REStud) — SMEs with high VAPK in India
- Hsieh, Hurst, Jones and Klenow (2019) — U.S. labor market discrimination
- Akcigit, Baslandze and Lotti (2023 ECMA) — politically-connected firms in Italy
- Bento (2020) / Bento and Hwang (2021) — female / black entrepreneurs in the U.S.
- Morazzoni and Sy (2022 JME) — high VAPK among U.S. female entrepreneurs
- Chiplunkar and Goldberg (2021 R&R ECMA) — female entrepreneurs in India

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Surveys

- Syverson (2011 JEL) – within U.S. manufacturing
- Hopenhayn (2014 Annual Reviews) – concepts
- Donaldson (2015 Annual Reviews) – trade within and across countries
- Restuccia and Rogerson (2017 JEP) – evidence for agriculture as well

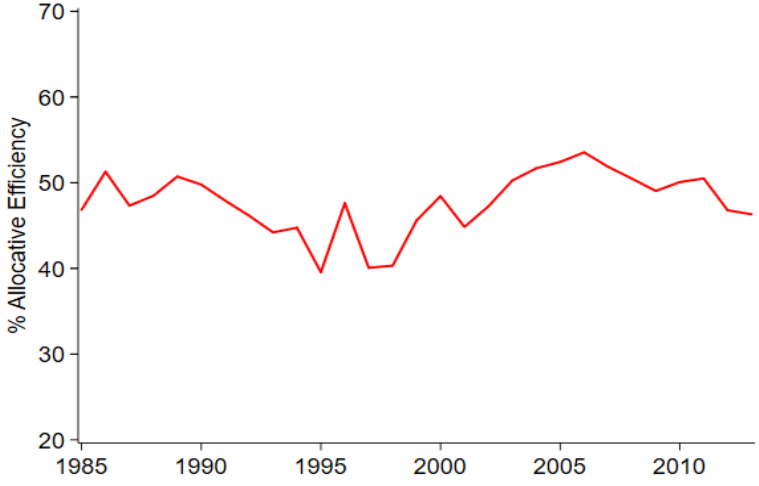
Some publicly available datasets

- Indian Annual Survey of Industries (ASI) 1980–1981 through 2017–2018
- Chilean manufacturing plants, 1985–2014 (e.g., Asturias et al., 2019)
- Indonesian manufacturing firms, 1965–1999 (e.g., Peters, 2020)
- Colombian manufacturing plants, 1982–1998 (e.g., Midrigan and Xu, 2014)
- Compustat publicly-traded firms in the U.S. (e.g., David and Venky, 2019)

More detail on the Indian ASI

- Census of large plants ($>$ 100 or 200 workers), 1/3 sample of smaller plants
- In some years, unit prices for output and detailed intermediate inputs
- Downloadable at `http://microdata.gov.in/nada43/index.php/catalog/ASI/about`
- BKR (2021) analyze 1984–1985 through 2012–2013
  - Code to calculate AE, TFPR, TFPQ, VAP's via the Big Data Initiative

Allocative Efficiency (AE) in India over time



Some harder to get datasets

- Chinese Industrial Firms, 1998–2013 (e.g. David and Venky, 2019)
- Korean manufacturing plants, 1985–2014 (e.g., Midrigan and Xu, 2014)
- Vietnamese firms, 2006–2010 (e.g., Bai et al., 2017 EJ)
- Mexican establishments 1998, 2003 and 2008; (e.g., Hsieh and Klenow, 2014)
- Orbis — firms in many countries (e.g., Gopinath et al., 2017 QJE)

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Plant-to-Table(s and Figures):
Processed Manufacturing Data and Measured Misallocation

There is a lot of imputation in the U.S. Census data (well beyond administrative records)

Understates TFPR dispersion in the U.S.

Not being done in Indian data (?)

So more misallocation in the U.S. than typically realized

Smaller gap in allocative efficiency between U.S. and India

Bils, Klenow and Ruane (2021 JME)

Misallocation of Mismeasurement?

In U.S. manufacturing, allocative efficiency seemingly plummeted 55% since 1980

Regress Revenue growth on Input growth — coefficient is decreasing in TFPR

Increasingly negative relationship over the sample

Paper argues this reflects growing measurement error in revenue and inputs

Finds a much more modest decline in allocative efficiency in the U.S.

And finds U.S. has consistently higher allocative efficiency than India

Asker, Collard-Wexler and De Loecker (2014 JPE)

Dynamic Inputs and Resource Mis(Allocation)

Costs of adjusting capital result in VAPK dispersion in the face of firm-specific productivity shocks

World Bank Enterprise Survey countries with bigger VAPK dispersion exhibit higher time series volatility of firms-specific shocks

Adjustment costs reduce aggregate productivity, but perhaps this is constrained efficient rather than being misallocation

Caution: tons of missing data, mysterious sampling frame in WBES

Sources of Capital Misallocation

Data on Compustat firms in the U.S. and medium-to-large private firms China

Convex adjustment cost imply persistent investment rate differences across plants or firms

They document low persistence $\Rightarrow$ a small role for convex adjustment costs

Non-convex adjustment costs? Not enough inaction or volatility of investment

Find a big role for the firm fixed effect in VAPK

Kehrig and Vincent (2020, R&R at REStud)

Good Dispersion, Bad Dispersion

Most TFPR dispersion across plants within U.S. manufacturing is *within firms*

Argue this reflects nonconvex adjustment costs + financial frictions

Alternatives: Production elasticites vary across plants within firms
Markups vary across plants within firms
Misallocation within firms

Managing Resource (Mis)Allocation

Again, most TFPR dispersion across plants within U.S. manufacturing is *within firms*

Argue this is due to misallocation within firms

Document that within-firm dispersion in TFPR is negatively correlated with management quality and is positively correlated with the number of divisions and plants

Misallocation Measures: The Distortion that Ate the Residual

Entertain linear demand (VES) + monopolistic competition $\rightarrow$ heterogeneous markups

And RTS < 1, though still isoelastic output wrt inputs

Present evidence that TFPR is increasing in TFPQ across 11 U.S. industries

Estimate RTS ≈ 1 and linear demand parameters

These deviations from CES and CRS can reduce misallocation for given wedges

Dhingra and Morrow (JPE 2019)

Monopolistic Competition and Optimum Product Diversity Under Firm Heterogeneity

CES + monopolistic competition + free entry $\rightarrow$ no static misallocation and optimal entry

VES + monopolistic competition + free entry $\rightarrow$ static misallocation

SP wants to equate TFPR (VMP's) across firms

Can have too much or too little entry

Edmond, Midrigan and Xu (2023 JPE)

How Costly are Markups?

Model with VES, monopolistic competition, intermediate inputs, and free entry

Welfare cost $\sim$ 7% of permanent consumption

- 2/3 from average markup (distorts intermediates vs. labor, labor supply)
- 1/3 from markup dispersion (misallocation)
- $\sim$ 0 from entry (distorted little)

VES matters — shrinks misallocation relative to CES for given TFPR dispersion

Peters (2020 ECMA)

Heterogeneous Markups, Growth and Endogenous Misallocation

Quality ladders + Bertrand competition

Endogenous growth model with creative destruction and incumbent innovation

Entry barriers $\rightarrow$ less entry $\rightarrow$ more incumbent innovation, more misallocation

Similar growth rate (less creative destruction, more incumbent innovation)

Tests mechanisms using data on manufacturing plants in Indonesia

Costinot and Donaldson (2016, R&R ECMA)

How Large Are the Gains from Economic Integration?
Theory and Evidence from U.S. Agriculture, 1880-1997

Infer declining costs of agricultural trade between U.S. counties from 1880 to 1997

Leads to more suitable crops (wrt soil, climate) being grown on fields within counties

Estimate this *quadrupled* aggregate agricultural productivity

As important as rising yield per field for a given crop (hybrid seeds, tractors, fertilizer)

Technology, information, or policy?

The Life Cycle of Plants and India and Mexico

In the U.S., plants grow or die. In India, they stagnate. Mexico is intermediate.

Why? If bigger plants face barriers, plants may invest less in ”organizational capital”

Bento and Restuccia (2017 AEJ-Macro) go further and say these barriers make Indian plants invest less in quality before entry and start smaller as a result


Age shall wither them
Index of employee numbers at average company
Employment at company's birth=1
United States
Mexico
India
10
8
6
4
2
1
0
<5
5-9
10-14
15-19
20-24
25-29
30-34
≥35
Age of company, years
Source: World Bank

Restuccia and Santaeulalia-Llopis (2017)

Land Misallocation and Productivity

In Malawi, massive variation in farm TFPR (even controlling for land quality)

Argue better farmers do not use more land because most of it is untitled

May also be ”wedges” in hiring non-family workers, financing, intermediate inputs

Says reallocating land across farms could more than triple aggregate farm TFP

Adamopoulos, Brandt, Leight, and Restuccia (2022 ECMA)

Misallocation, Selection and Productivity:
A Quantitative Analysis with Micro Data from China

Frictions in land and capital markets constrain most productive farms from being larger

Also leads to misallocation of talent across sectors — too many marginally talented workers in agriculture who should be working in other sectors

Cuts TFP in half (2/3 of this misallocation is across villages, 1/3 within)

Gollin and Udry (2021 JPE)

Heterogeneity, Measurement Error and Misallocation: Evidence from African Agriculture

Panel data on farms in Uganda and Tanzania

Key assumption: No misallocation across plots within farms who sell homogeneous crops

Idiosyncratic shocks, heterogeneity, measurement error explain 2/3 of TFPR dispersion

Find misallocation is vastly oversated in both countries

Financial Frictions

Some of the many papers:

- Buera, Kaboski and Shin (2011 AER)
- Gilchrist, Sim and Zakrajsek (2013 RED)
- Banerjee and Duflo (2014 REStud)
- Midrigan and Xu (2014 AER)
- Moll (2014 AER)
- Cole, Greenwood and Sanchez (2016 ECMA)
- Gopinath, Karabarbounis, Kalemli-Ozcan, and Villegas-Sanchez (2017 QJE)
- Bau and Matray (2023 ECMA)
- David, Schmid and Zeke (2022 JFE)

Lagakos (2016 JPE)

Explaining Cross-Country Productivity Differences in Retail Trade

Small stores used to dominate retail employment in Argentina, Brazil, El Salvador, Mexico, the Philippines and Thailand

Supermarkets have long dominated retail employment in the U.S.

Retail VA per worker used to be much higher in the U.S., but not so much for supermarkets

Why the difference? Cars, according to Lagakos

Tariffs on imports, and cars are indivisible so amplify income differences

Readings (1/6)

Required:

- David and Venkateswaran (2019 AER) ▸ David and Venky
- Hsieh, Hurst, Jones and Klenow (2019 ECMA) ▸ HHJK

Supplemental papers (in order of appearance in slides):

- Hsieh and Klenow (2009 QJE)
- Bils, Klenow and Ruane (2021 JME)
- Bartelsman, Haltiwanger and Scarpetta (2013 AER)
- Dhingra and Morrow (2019 JPE)
- Buera, Kaboski and Shin (2011 AER)

Readings (2/6)

- Moll (2014 AER)
- Midrigan and Xu (2014 AER)
- Asker, Collard-Wexler and De Loecker (2014 JPE)
- Edmond, Midrigan and Xu (2023 JPE)
- Baqaee and Farhi (2020 QJE)
- Hsieh, Hurst, Jones and Klenow (2019 ECMA)
- Brouillette (2022 working paper)
- IADB (2010) *The Age of Productivity*
- Peters (2020 ECMA)
- Restuccia and Santaeulalia-Llopis (2017 working paper)
- Adamopoulos, Brandt, Leight, and Restuccia (2022 ECMA)

Readings (3/6)

- Misch and Saborowski (2018) book on resource misallocation in Mexico
- Hsieh and Klenow (2014 QJE)
- Bento and Restuccia (2017 AEJ-Macro)
- Akcigit, Alp and Peters (AER 2021)
- Atkeson and Burstein (2010 JPE)
- Fattal Jaef (2021 AEJ-Macro)
- David and Venkateswaran (2019 AER)
- Kehrig and Vincent (2020 working paper)
- Hopenhayn and Rogerson (1993 JPE)
- Guner, Ventura and Xu (2008 RED)
- Garicano, Lelarge, Van Reenen (2016 AER)

Readings (4/6)

- Fajgelbaum, Morales, Suarez Serrato, and Zidar (2019 REStud)
- Cavalcanti, Kaboski, Martins, and Santos (2021 working paper)
- Blattner, Farinha and Rebelo (2019 working paper)
- Bau and Matray (2023 ECMA)
- Bazzi, de Freitas Oliveira, Muendler and Rauch (2021)
- Fonseca and Matray (2022)
- Autor, Dorn and Hanson (2013 AER)
- Goldberg and Pavcnik (2017 JEL)
- Atkin, Faber and Gonzalez-Navarro (2018 JPE)
- Ryan and Sudarshan (2020)
- Banerjee and Duflo (2014 REStud)

Readings (5/6)

- Akcigit, Baslandze and Lotti (2023 ECMA)
- Bento (2020 working paper)
- Bento and Hwang (2021 working paper)
- Morazzoni and Sy (2022 JME)
- Chiplunkar and Goldberg (2021 working paper)
- Syverson (2011 JEL)
- Hopenhayn (2014 Annual Reviews)
- Donaldson (2015 Annual Reviews)JEP)
- Restuccia and Rogerson (2017 JEP)
- Asturias, Hur, Kehoe and Ruhl (2019 working paper)
- Bai, Jayachandran, Malesky and Olken (2017 Economic Journal)

Readings (6/6)

- Gopinath, Karabarbounis, Kalemli-Ozcan, and Villegas-Sanchez (2017 QJE)
- Rotemberg and White (2021 working paper)
- Giroud, Matvos, Seru and Silva (2018 working paper)
- Haltiwanger, Kulick and Syverson (2018 working paper)
- Costinot and Donaldson (2016 working paper)
- Gollin and Udry (2021 JPE)
- Gilchrist, Sim and Zakrajsek (2013 RED)
- Cole, Greenwood and Sanchez (2016 ECMA)
- David, Schmid and Zeke (2022 JFE)
- Lagakos (2016 JPE)